May 1971 Brief 71-10102

AEC-NASA TECH BRIEF

Space Nuclear Systems Office

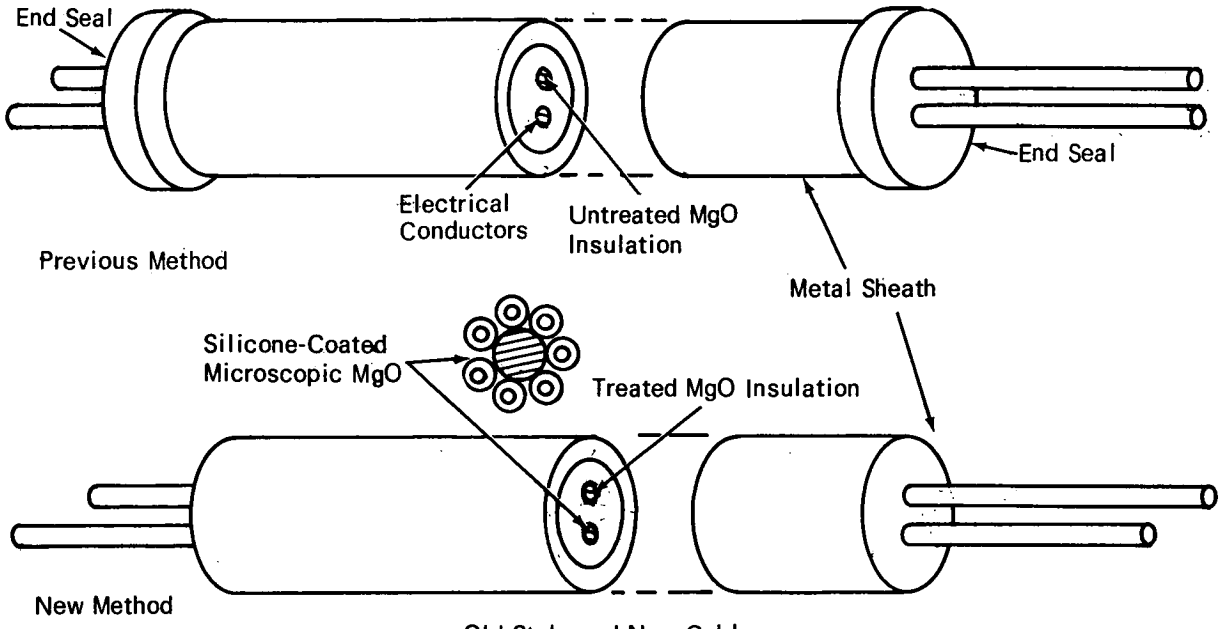
Improved High-Temperature Metal-Sheathed Cables

The problem:

Prevent moist-air degradation of high-temperature metal-sheathed cables insulated with magnesium oxide (MgO). At all stages, including fabrication, transport, assembly, installation, and use, even moderate exposure to moisture drastically reduces the insulating qualities of MgO. The cable is generally fabricated and handled in a controlled, dry atmosphere. The ends are sealed hermetically with glass, ceramics, or organics, depending on the service environment (see fig.). Such practices are time consuming and do not ensure reliability during rigorous service.

The solution:

Treat the insulation with an electrical-grade silicone oil, which repels moisture. The oil's in-service high-temperature range is normally limited by ambient oxygen and the loss of volatile constituents. However, the temperature range can be extended if the oil is used in a "contained" situation so that neither of these factors is effective. Similarly, the oil can be polymerized by the proper application of heat to produce a water-repellant surface coating.



Old Style and New Cables

How it's done:

Beads of MgO are soaked in electrical-grade silicone oil, outgassed, and placed around the con-

(continued overleaf)

ductors within the metal sheath. When the assembled cable is then reduced to its final diameter by the standard rotary-swaging process, the beads are crushed to microscopic particles. The cables are then subjected to a 5-hr, 811°K (1000°F), silicone-polymerization cycle.

Preliminary laboratory tests indicate that the oil provides efficient protection and useful service between 922° and 77.60°K (1200° and −320°F). Specimens of new cable have survived 8-month exposure to uncontrolled atmospheres without loss of electrical qualities.

Hermetic seals on the cable ends can now be replaced by simpler, mechanical treatment. The cable remains serviceable even after cracking or other damage to the sheath, and complex handling requirements have been eliminated.

This new cable should have application in thermocouple instrumentation, oceanography, chemical processing, seismology, medicine, aircraft, and a variety of other fields.

Note:

Requests for further information may be addressed to:

Technology Utilization Officer
AEC-NASA Space Nuclear Systems Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: TSP71-10102

Patent status:

No patent action is contemplated by AEC or NASA.

Source: H. A. Fox, Jr., of
Aerojet Nuclear Systems Co.,
Div. of Aerojet-General Corp.
under contract to
AEC-NASA Space Nuclear Systems Office
(NUC-10413)